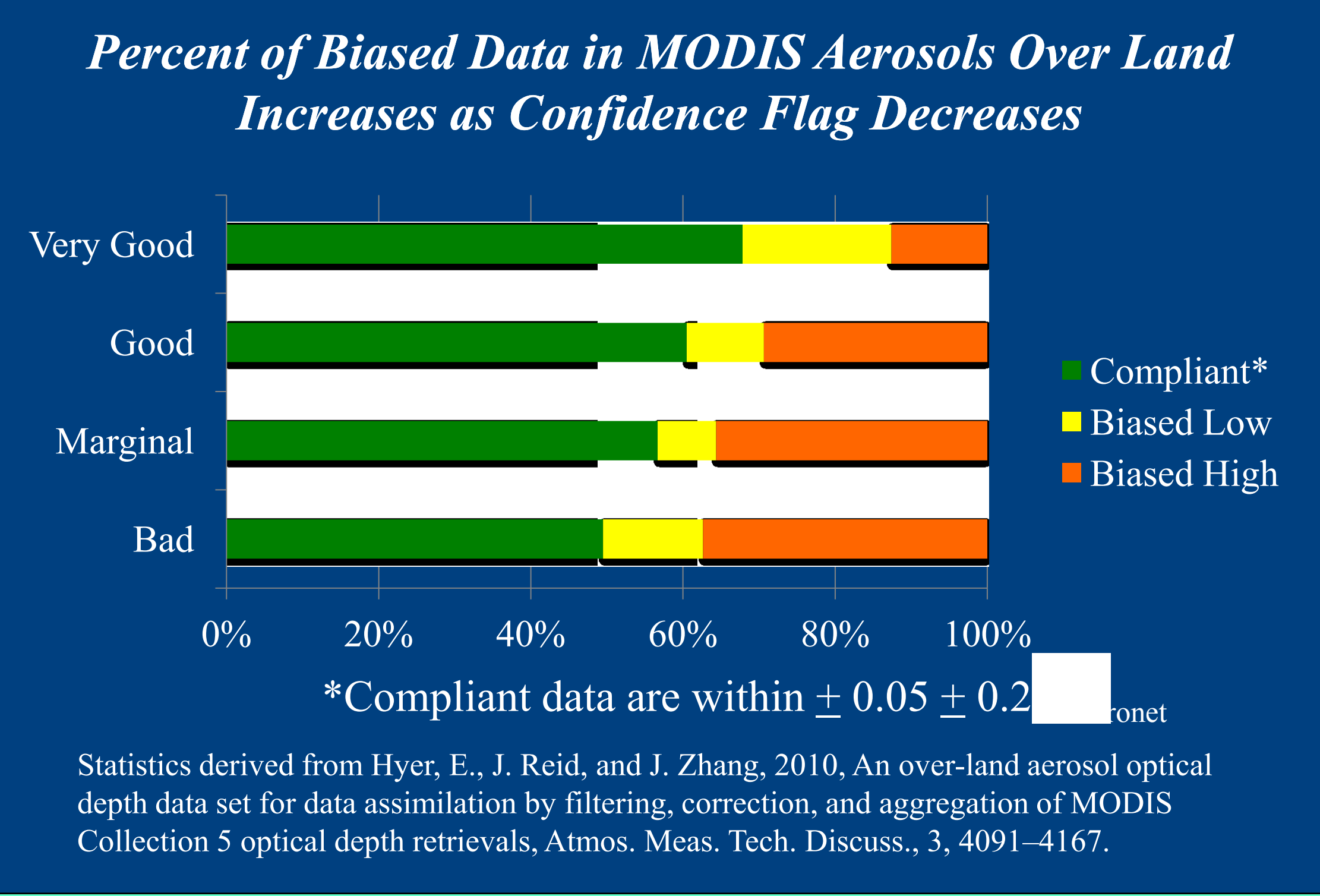# Data Quality Screening Service for MODIS Level 2 Data

Christopher Lynnes, Richard Strub, Thomas Hearty, Bruce Vollmer
Goddard Earth Sciences Data and Information Sciences Center
Robert Wolfe, Suraiya Ahmad, Neal Most, Karen Horrocks, Greg Ederer
Cid Praderas, Ivan Tcherednitchenko, , Gang Ye, Ali Rezaiyan-Nojani
MODIS Adaptive Processing System
Peter Fox, Stephan Zednik, Patrick West, Tetherless World Constellation, RPI
Edward Olsen, Jet Propulsion Laboratory

Objective: Provide a quality screening service

- Level 1 and 2 satellite data products typically keep all retrieved values.
- Quality Control "flags" are often available for these data
  - Describe instrument performance and calibration
  - Reflect observing conditions (e.g., cloud fraction)
  - Are based on algorithm "happiness"
- *Statistically*, the better the quality flag, the less likely it contains systematic biases.

Percent of Biased Data in MODIS Aerosols Over Land Increases as Confidence Flag Decreases

Legend: Compliant*, Biased Low, Biased High

*Compliant data are within ± 0.05 ± 0.2

Statistics derived from Hyer, E., J. Reid, and J. Zhang, 2010, An over-land aerosol optical depth data set for data assimilation by filtering, correction, and aggregation of MODIS Collection 5 optical depth retrievals, Atmos. Meas. Tech. Discuss., 3, 4091–4167.

Goal: Help users apply proper screening to data using quality flags

(a) Quality Control flags can be complicated to handle

Two Different AIRS Quality Schemes

Easy: Quality level for total precipitable water

Not So Easy: Highest pressure of "Best" quality values in moisture profiles

Hurricane Ike, viewed by the Atmospheric Infrared Sounder (AIRS)

MODIS Quality Bitfields in Cloud_Mask_SDS

Cloud Mask Status Flag
0=Undetermined
1=Determined

Cloud Mask Cloudiness Flag
0=Confident cloudy
1=Probably cloudy
2=Probably clear
3=Confident clear

Day/Night Flag
0=Night
1=Day

Sunglint Flag
0=Yes
1=No

Snow/Ice Flag
0=Yes
1=No

Surface Type Flag
0=Ocean, deep lake/river
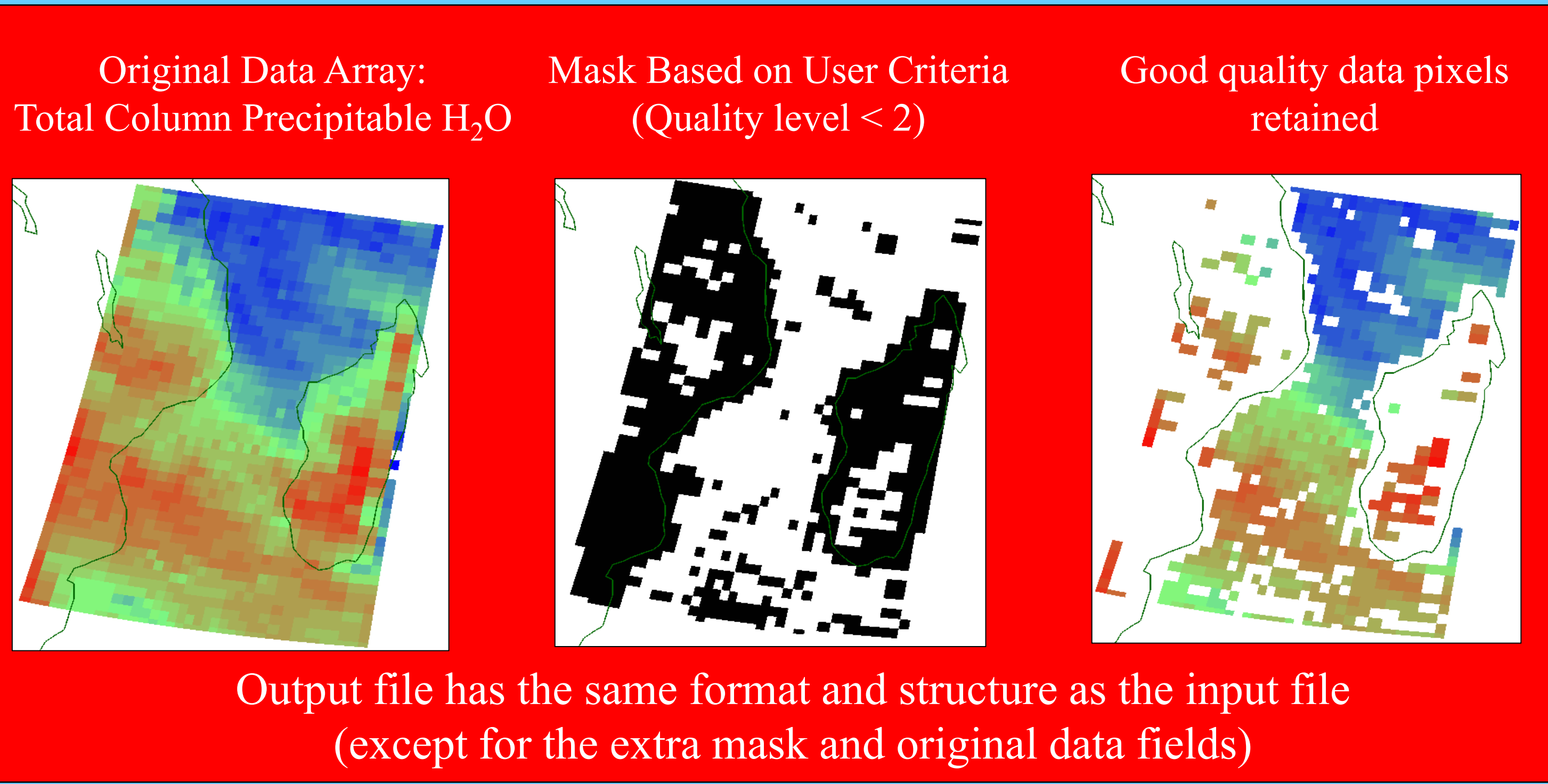1=Coast, shallow lake or river
2=Desert
3=Land

(b) Interpretations and recommendations vary across and within instruments

AIRS Quality Levels		MODIS Aerosols Confidence Flags		
		Ocean	**Land**	Use these flags to have 2/3 of values within expected error bounds
0 Best	*Data Assimilation*	3 Very Good	3 Very Good	**Ocean** **Land**
1 Good	*Climatic Studies*	2 Good	2 Good	
2 Do Not Use		1 Marginal	1 Marginal	±0.03 ± 0.10 ±0.05 ± 0.15
		0 Bad	0 Bad	

The Data Quality Screening Service (DQSS) filters out bad pixels for the user

Original Data Array: Total Column Precipitable H_2O | Mask Based on User Criteria (Quality level < 2) | Good quality data pixels retained

Output file has the same format and structure as the input file (except for the extra mask and original data fields)

Status: DQSS is available for MODIS L2 Aerosols (M*D04_L2.051) and L2 Water Vapor (M*D05_L2.051) at MODAPS*

Also available for AIRS L2 and MLS L2 data at GES DISC

MODAPS Post-Processing Selection Interface

Set Post Process Criteria

You have selected a total of **7 files** to post-process. Each product file will be processed using the stages listed below.

Data Quality Screening Service (DQSS)

Please select from the following criteria to include data with the selected quality value and better in the order:

Product: MOD04_L2

	NoScreening for Determined Values	Marginal	Good	VeryGood
Effective_Optical_Depth_Best_Ocean[1]	○	●	○	○
Deep_Blue_Aerosol_Optical_Depth_Land[2]	○	○	●	○
Effective_Optical_Depth_Average_Ocean[3]	○	●	○	○
Corrected_Optical_Depth_Land[4]	○	○	○	●

[1]Screening criteria for Effective_Optical_Depth_Best_Ocean will also be applied to Optical_Depth_Small_Best_Ocean.

[2]Screening criteria for Deep_Blue_Aerosol_Optical_Depth_Land will also be applied to Deep_Blue_Aerosol_Optical_Depth_550_Land, Deep_Blue_Angstrom_Exponent_Land, Deep_Blue_Single_Scattering_Albedo_Land.

[3]Screening criteria for Effective_Optical_Depth_Average_Ocean will also be applied to Angstrom_Exponent_1_Ocean, Angstrom_Exponent_2_Ocean, Effective_Radius_Ocean, Optical_Depth_Small_Average_Ocean.

[4]Screening criteria for Corrected_Optical_Depth_Land will also be applied to Angstrom_Exponent_Land, Corrected_Optical_Depth_Land_wav2p1.

Screening criteria for Effective_Optical_Depth_Average_Ocean and Corrected_Optical_Depth_Land will also be applied to the global Optical_Depth_Land_And_Ocean.

Notes:
- The MODIS science team recommends using only data tagged with "Very Good" for pixels over land.
- The MODIS science team recommends using data tagged with "Marginal", "Good", or "Very Good" for pixels over ocean.
- Aerosol Deep Blue are not available for Terra after December 2007 due to the unavailability of the required polarization corrections to the L1B data. The Aerosol Deep Blue are available for Aqua for the entire mission.
- All dimensions and attributes of the original data file will be preserved.

2 Mar 2010

MODIS Terra AOD 550 nm

Before Quality Filtering

-0.05   0.8

Confidence Flag from Quality_Assurance_Ocean & Quality_Assurance_Land

0   1   2   3

After Quality Filtering

-0.05   0.8